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The Agricultural College

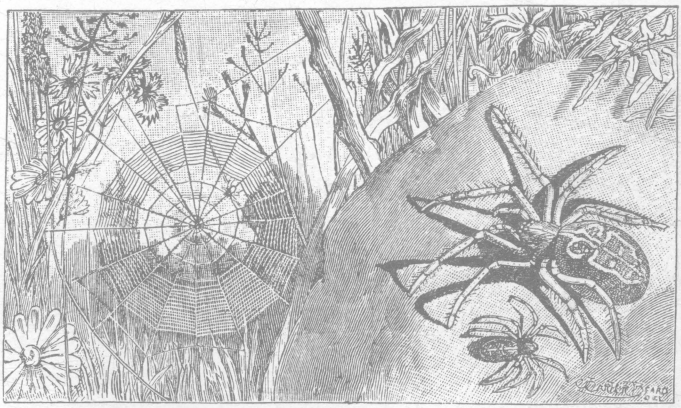
EXTENSION BULLETIN

HABITS OF OUR COMMON SPIDERS

BY PROFESSOR F. L. LANDACRE

CONDITIONS NECESSARY FOR PLANTS TO GROW WELL

BY A. B. GRAHAM



From Kelleys "Shy Neighbors", Pub. by American Book Co.

THE COMMON GARDEN SPIDER

How innocent you seem,—how modest, shy;
I'm sure I should be caught were I a fly;
For when with luring tone you whispered low,
"Please walk into my parlor," I should go.

SELECTED FROM "SHY NEIGHBORS."

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The Agricultural College Extension Bulletin

Adopted by the

Board of Control of the Ohio Teachers' Reading Circle.

The Board of Control of the Ohio Teachers' Reading Circle at its meeting held Saturday, May 12, 1906 passed resolutions, adopting the Agricultural College Extension Bulletin for the use of the members of the Ohio Teachers' Reading Circle and directing the Corresponding Secretary to furnish the names of members to the Ohio State University for the mailing list.

Elementary Agriculture

During the coming year the teachers of Ohio will take up the study of Elementary Agriculture using as a text the book recently adopted by the Board of Control of the Ohio Teachers' Reading Circle, James' Practical Agriculture, published by D. Appleton & Co., 378 Wabash Ave., Chicago, Ill. This text together with the Agricultural College Extension Bulletins will furnish all that could be desired in the way of helps to make this work of the greatest value and benefit to the teachers. It is confidently expected that the movement that has been fostered by this Bulletin will go on until every school child in the state has received benefit and the teaching of the elements of agriculture has become fixed as a part of the curricula of all schools. It may be of interest to some to learn that this line of work is being taken up by the city schools and that both teachers and pupils are manifesting much interest in it.

Herewith is appended a list of the books adopted by the Board of Control for the use of the Teachers' Course.

I. PEDAGOGY: King's "Rational Living", (The Macmillan Company).

II. LITERATURE: Vincent's "American Literary Masters," (Houghton, Mifflin & Co.) and Macaulay's Life of Johnson, (any edition permitted.)

III. NATURE STUDY: James' "Practical Agriculture" (D. Appleton & Co.) and the Agricultural College Extension Bulletins, (published by the Ohio State University).

Habits of Our Common Spiders

Prof. F. L. Landacre.

The habits of some of our common spiders furnish an interesting field for study to the beginner in Natural Science. The only obstacle to a very general interest, seems to be the prevailing notion that spiders are venomous and that a study of their habits is taken up with some risk. Now, while all spiders are to a greater or less extent poisonous, the use of the poison is so limited to the securing of prey, that so far as the writer knows, no well-established proof of injury to persons in handling or observing them is on record.

There certainly is no group of lower animals in which there is a more remarkable adaptation of habits to surroundings in the way of meeting and overcoming difficulties in securing food and building homes. Most of the interesting habits of spiders can be grouped about these two activities: First, the building of nets and traps for securing prey; second, the building of homes, such as trap-doors and cocoons, for the preservation of the eggs and young.

The common spiders found in this locality can be divided into several groups.

Jumping and Running Spiders

The jumping spider has a small, active form, and is found on sides of buildings and fences. The group of running spiders is much larger and is characterized by the rapidity with which its members scurry over the ground to places of retreat. Neither of these spin regular webs, but almost every spider spins more or less, so that if detached from an object its fall is prevented by its ability to swing by a web. Almost every one must have observed the mats of spider webs on grass and meadow land, made in the early morning. These sometimes are so thick that the fields seem to be covered by a silvery sheen.

The Cob-Web Weaver

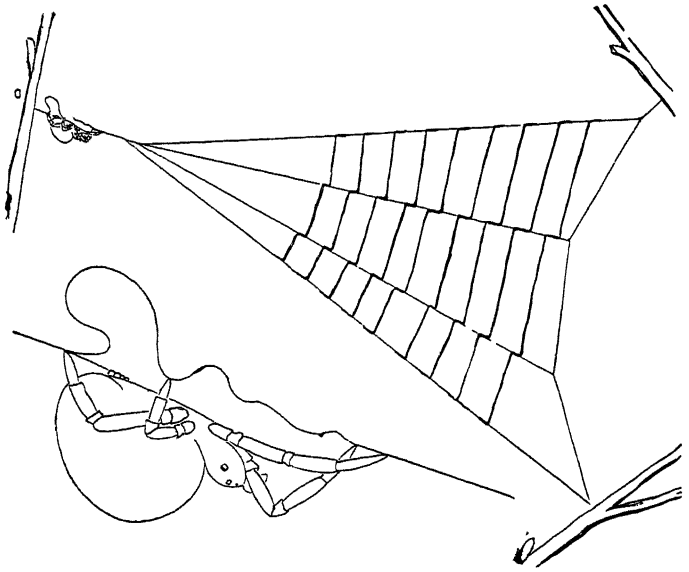
Another very common group of spiders is the cob-web weaver, which makes irregular masses of cob-web, frequently in houses, barns, among weeds, etc. These webs are never regular. It is these spiders that weave the webs which give the housewife so much concern.

The Funnel Weavers

Another group of spiders that represents a high grade of weaving habits is the group which weaves the cone-shaped web. The web is like an open funnel, in which the spider usually rests, but when frightened, scurries back through the small end and escapes by deserting its web completely. A very interesting study for the young student is to ascertain in what way these funnel weavers adapt their webs to different localities. It should be noticed how the spider forms a web which, while conforming to a general type, still shows some change which suits it to the particular locality in which the spider happens to be working.

The Triangle Weavers

Next, perhaps, in interest, comes the triangle weavers; a spider which makes a web in the shape of a triangle, with a very long line extending from the apex, or small end of the triangle, to some distant point of attachment. The writer remembers quite well his first attempt to find a triangular web. The description which he had read said nothing about the size of the web. After hunting many times, he happened to be walking through a woods, and his attention was attracted to a very strong web stretched across the path, which had accidentally touched his face. On examining the web, it proved to be a long thread attached to the small end of the triangle; the triangle and web together being fully fifteen feet in length. The really remarkable thing about this triangle and thread is the way the spider uses it. The spider does not sit on the triangular portion, but on the long thread, and gathers it up in its feet so that there is quite a quantity of loose



THE TRIANGLE WEAVER'S WEB.
Lower picture shows how the spider takes up the slack in the web.

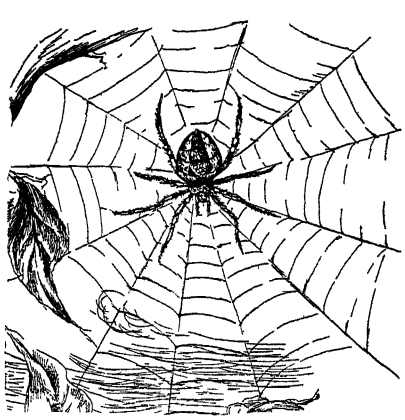
thread in its grasp, very much as one would tighten a clothes line by drawing the line tight and allowing the loose portion to lie on the ground, thus stretching the line; so the spider stretches the mesh of the triangular web. Now, if some insect happens to fly into the triangular portion, the spider immediately loosens the slack web which it has taken in, thus allowing the fibre in the mesh to entangle the struggling insect.

While it may not be possible for every person to discover one of these triangular webs, it is very interesting for him to attempt to explain the action of the animal when it tightens the thread.

Does it mean that the animal is in any sense "conscious" of the result which will follow its action, or does it simply mean that the action is performed without any knowledge or conception of the result, so that we would place it among the simpler methods of acting, such as a reflex or instinctive action?

The Orb Weavers

The next group of spiders is in many ways the most interesting and remarkable of all of them. These are the orb weavers. They are usually known as garden spiders, of which there are several species, but the one most commonly found, perhaps, will be one of the larger, brilliantly colored forms, characterized by the large size of its web, frequently 12, 14, or 16 inches in diameter, and by the brilliant marking of the body. Almost any boy or girl who cares to do so, can watch the spinning habits of this interesting animal. The time for spinning is usually late in the afternoon and evening. Some of the orb weavers build a new web almost every day, especially if the old web has been destroyed. Others repair the old webs, and do not build new ones except when the old ones have been destroyed. However, the question of building new webs or repairing old ones needs to be studied.



AN ORB WEAVER'S WEB.

AN ORB WEAVER'S WEB.

Both have been drawn for school books by artists. Neither of them is correct. What is wrong? Note the difference between these and the web on the cover page.

The places in which these spiders build are usually somewhat secluded. They may, however, build about flower-beds, shrubbery, fences, especially barns, out-buildings, so that almost any yard or home will furnish material for observation. The method of constructing their web is exceedingly interesting. The spider usually selects some place where it is possible to arrange a system of long guy ropes, such, for instance, as the angle between the posts and roof of a veranda. The first thing the spider does is to stretch a thread from some elevated point down some distance to a lower point. The first thread may be fifteen or sixteen inches long, or it

may be several feet. The first thread stretched seems to be more or less irregularly, almost aimlessly, placed by some spiders. The spider uses the center of one of its long threads like the center of a wheel, and from that point constructs lines like the spokes of the wheel, the center corresponding to the hub. Sometimes the spider does this by attaching a thread at the center, crawling out on a thread already stretched, and finally attaching this second thread. The radiating thread may, in same cases, be attached to some guy rope, in a few cases it may be attached to surrounding objects. The spider, after finishing these radiating lines, goes to the center of the web and begins to form a spiral, that is, a continuous thread running around and around, getting farther away from the central point.

This is kept up until the diameter of the orb or wheel is ten or twelve inches. The reason for beginning at the center is because th radiating lines are so far apart that the spider cannot step from one to the other without traveling on the spiral line laid down at its previous round. After this first spiral is formed, the spider replaces it by a second spiral formed of a different kind of silk. The first silk is rather dry and tough, being particularly suited for the forming of guy ropes and radiating lines, but is not very sticky and is not very well suited for holding insects.

The spider in putting on these sticky threads, begins at the outside of the orb and works towards the center, destroying the old spiral as it lays down the new sticky line. The old line is finally completely replaced by the sticky line and the web is ready for use.

Sometimes the broad, ladder-like web is stretched across the orb, passing through the center in order to strengthen it. The spider usually occupies the center of the web and some exceedingly curious habits may be noticed if a web is found. For instance, if an insect alights on the web suddenly, the spider will jerk the threads which run from the center towards the insect, first drawing them tight and then freeing them, which results in entangling the insect. Sometimes, if an insect comes near but does not get into the net, the spider sets the web to swinging back and forth by first drawing the threads of the web tight and then allowing them to go. This can be easily observed by gently touching the back of the spider as it sits in the middle of the web.

The Balloon Builders

One more of the interesting common spiders will be mentioned. This is the balloon builder. Every one has observed the meshes of a floating cobweb during the fall of the year, which are the result of this little animal's work. This particular spider can usually be found on the top of fences, posts or similar objects. The little spider, when in the act of spinning a web, if the wind is blowing sufficiently to float the web, stands on its fore-legs, with the hind part of its body elevated, and the web streaming out behind several feet. If one approaches the place where the spiders are spinning, they frequently jump up from the top of the post

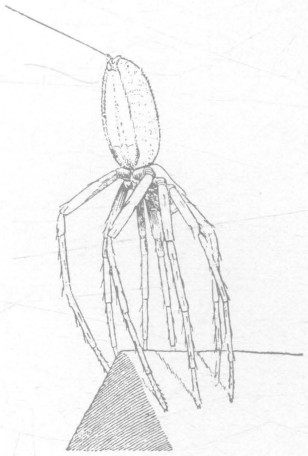
apparently testing the amount of the web to see if it is sufficient to carry them. If it is sufficient, the spider sails away with it; if it is not sufficient, the little fellow scurries away to some place of safety.

It may be, perhaps, of interest to know that the spiders found are almost invariably females. The male is very small and usually spins a much less regular web than do the females.

Weaving of the Cocoon

This same garden spider which we have been discussing also spins a wonderful vase-shaped cocoon, in which it lays its eggs, or rather, spins part of the cocoon first, lays its eggs, and then finishes its cocoon. The making of the cocoon usually is done very early in the morning; so far as the writer has observed, between one and five o'clock. However, if some of the large garden spiders are placed in a glass aquarium during early September, they will sometimes spin their cocoons and the observer is well repaid for his trouble.

A very brief discussion of this spinning may be of interest.



A BALLOON WEAVER.

(Ready to be blown away.)

The web of this spider is found streaming from fence rails and weeds, and sometimes from our hats and faces.

From Hodge's Nature Study. Published by Ginn & Co., Boston.

This picture was made from a photograph of an orb weaver's nest.

The spider first establishes its guy ropes, as in the case of the orb, then spins a mass of fluffy brown silk about one-quarter of an inch long, and the size of a lead pencil; on the bottom of this is formed a dense platform, then another brown silk mass is placed under this, then a second platform, the two platforms being like the lid

A running spider with egg-sac.

and bottom of a bucket, while the interior is occupied by the brown silk. Under this platform it suspends itself back downwards, and lays its eggs up against the under side of the platform. It now weaves a basket about the eggs, so that the secret of getting the eggs into the basket is really that of placing the basket about the eggs. The spider now spins a mass of brown silk over the whole structure, and then, outside of this, it spins a dense, water-proof coating, looking like oiled silk. The top of the vase is left slightly open. The young spiders hatch in the fall, and remain inside the cocoon until the following spring. Very few of the original number leave the cocoon, many of the smaller and weaker ones being eaten by the larger ones. It is very interesting to attempt to answer the question as to whether the adult spiders are carniverous because the young are, or whether just the reverse is the case—the young are carniverous because their parents are.

Conditions Necessary For Plants to Grow Well

Experiment No. 1.

In each of two small tin cans or tumblers, plant beans, peas, or corn. After each has appeared above the ground, place one in the sunlight and the other in the cellar or under a box. Each must be given the same quantity of water. What difference in the plants do you notice?

Experiment No. 2.

In each of two small boxes or old tin cans, plant corn, beans, or peas. Bore or punch holes in the bottom of one for drainage. Let the other be without drainage. Place both in the sunlight. After the sprouts are above ground, pour sufficient water on the one provided for drainage so that it can be seen running from the holes. Pour the same quantity on the other. After a week, what difference do you see?

Experiment No. 3.

Plant a few grains of corn in a box of clean sand. In another can or box of loam plant the same number of grains the same depth. Provide drainage. Give same quantity of water to each. As the plants develop, what difference is noticed? Why is there a difference? In which was there the most plant food?

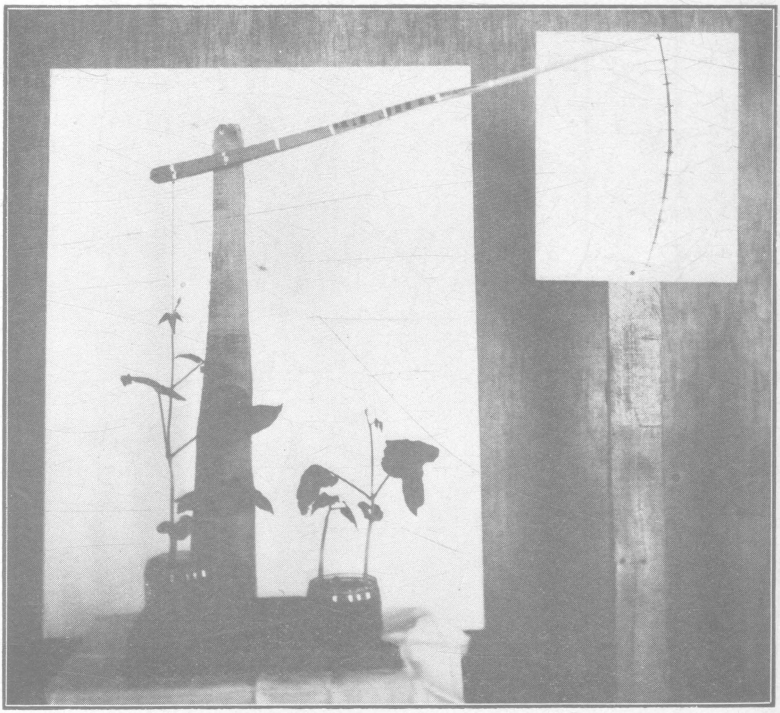
Experiment No. 4.

In each of two cans of loam or sandy clay, plant a few grains of corn. Punch holes for drainage. Moisten one with rain or warm water. Moisten the other with water to which eight or ten drops of ammonia or hartshorn have been added. (Have you ever noticed the odor of ammonia about the stables or barn-yard?) Which plant grows the most rapidly and with the darkest green color?

Experiment No. 5.

Plant corn in small baking-powder cans provided with drainage. After the corn is up about two inches, set one can on a piece of writing paper or any other strong paper. Place a glass fruit jar over the can and seal to the paper by using beeswax and a match. If the free air supply is completely cut off, which corn will grow the more rapidly?

By which experiment did we learn that sunlight is necessary for vigorous growth? By which that plant food is required? Ammonia or hartshorn contains nitrogen. Does it act as a plant food? How are plants supplied food on the farm? If the plant needs water, why is drainage necessary? Which is the warmer,



A simple device for measuring growth of a bean or morning glory. The arm on the right is eight times as long as the arm on the left of the upright piece.

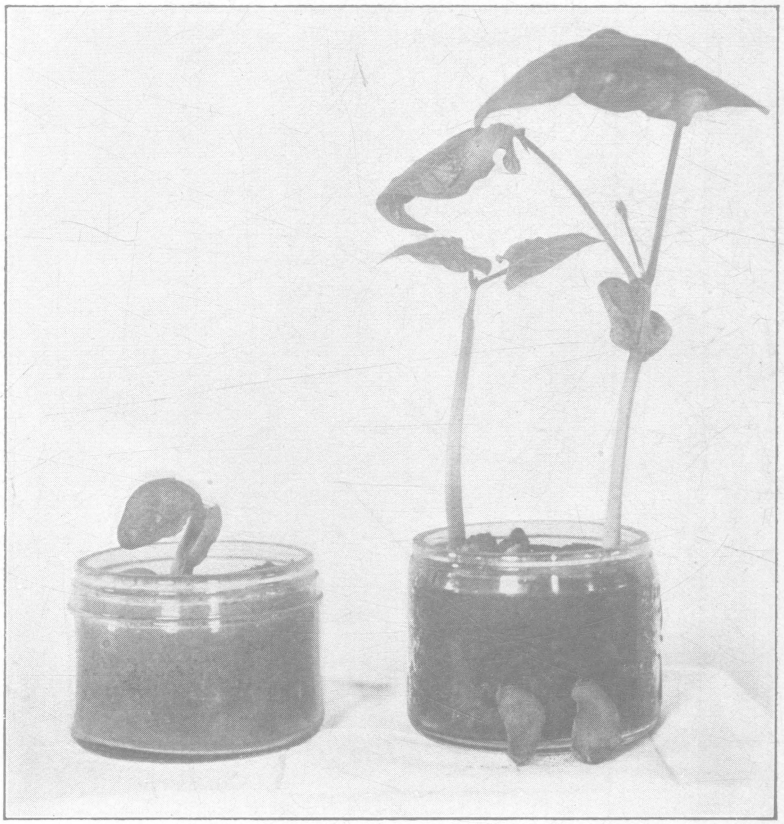
drained or undrained soil? Is free air necessary? Why? Where does the dampness on the inside of the glass jar, (in experiment No. 5) come from?

Why Plow or Spade?

Many years ago the ground was not as well prepared for planting as it is to-day. The plow of ancient times, and in some countries now, is little more than a forked stick used to stir the surface a very little. Even though Jethro Tull practiced tilling and Jethro Wood perfected the steel mould-board breaking plow, little has been definitely known why the soil should be plowed or spaded further than to furnish a seed bed.

In brief the following reasons are given:

To break the soil and make it mellow that the tender roots of the plant may enter it in their search for food and that it may



Beans planted in clay and sand. Beans planted in rich black dirt on the same day. Both plants in the right jar came up on the same day. The half-beans (cotyledons) were removed from one. One grew faster than the other because the half-beans furnished food.

get a firm hold to support that part of the plant which is above the ground.

To make the soil open that it may readily take into itself rain as it falls on its surface.

To let air to the roots of the plants.

To let air to the plant food in the soil that it may be more readily prepared for the plant.

To prevent too great loss of water by evaporation.

To make the soil warmer in the spring.

To make damp soils warmer.

To mix manures with the soil.

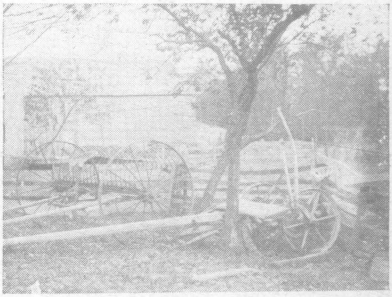
To turn insect enemies up to the surface that freezing, frost, or birds might destroy some of them.

To kill weeds.

To make such conditions—plenty of air, moisture, and heat—as will best sprout seeds.

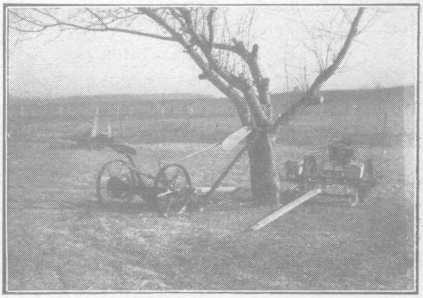
To assist certain beneficial soil bacteria to live and do their work.

Nitrogen or ammonia being carried away in the dark water in a nearby stream.



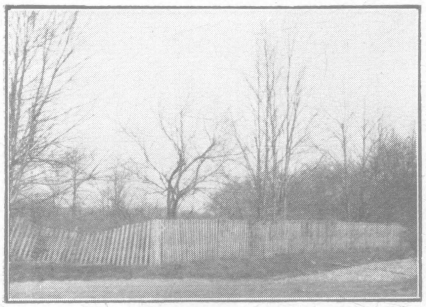
Haying time will come again next year.

Waiting for the next corn crop.

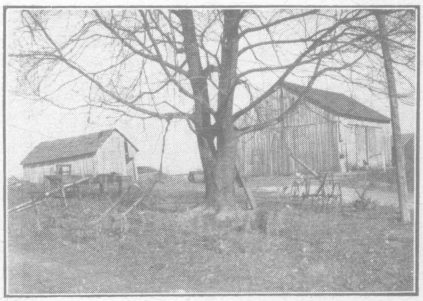


The blue sky and a poorly trimmed tree the only protection for mower and corn drill.

The whole story:—A little cash down and four annual payments for the rest of the time, the farmer trades his old machine for a new one and starts again.



More natural hedge than orchard.



Barn and shed but no room for farm implements.

Agricultural Club Work.

If boys are simply reading about soil, plants, insects, etc., the work that may pass as elementary agriculture has been but half done. Reading should be coupled with doing so far as it is practicable. Doing and observing assist in making the page of the book more easily understood.

Clubs composed of boys and girls in elementary and high schools have been organized by the teachers or superintendents to carry on tests or to make experiments and observations not only through the school term, but through the summer vacation. A few teachers and superintendents have given one afternoon or evening once a month through the vacation to meeting boys and girls for a discussion of some important topic that would be altogether unseasonable if allowed to pass by unnoticed until the fall term of school begins.

From the Readers for Our Little Readers.

In one of the lessons of a second reader the story tells us and the picture shows us that a large toad jumped into a freshly made flower-bed. Why would a toad jump into a flower-bed? In the picture the little girl has a shovel in her hand ready to kill the toad. Should she strike it? Try feeding lightning bugs to a toad. Just let one crawl a few inches in front of the toad. Keep your eyes steadily on the toad.

A little stanza of poetry begins:

Cowslips, daisy, violet,
In their little beds,
All among the grasses
Hide their heavy heads.

Do you know these flowers when you see them? Do they bloom at the same time of the year? Do all of them hide their heads in the grasses?

One fine day in July, George's mother sent him to the woods to

gather wood. He found some fine, ripe, wild strawberries. Are wild strawberries found in July?

When the sun was beginning to sink, George set out for home.

Did the sun set in the west, northwest, or southwest that evening?

Those who have read the story of "The Mountain Sister" ought to read the entire story from the book entitled "Seven Sisters," by Jane Andrews.

In the lesson "The Money Amy Didn't Earn" (McGuffey's Third Reader), it says that for five quarts Amy would receive sixty-five cents, and for a dozen quarts she would receive one dollar and fifty-six cents. Did she calculate correctly if she was to receive thirteen cents a quart?

WINDFLOWER OR ANEMONE.

HEPATICA—Has a very hairy stem.

SPRING BEAUTY.

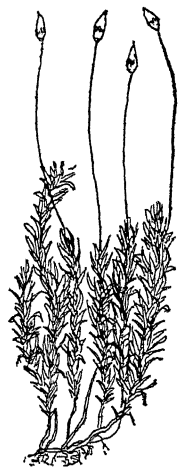
SHEEP'S SORREL

There is another sheep's sorrel with tiny yellow flowers

SHEPHERD'S PURSE

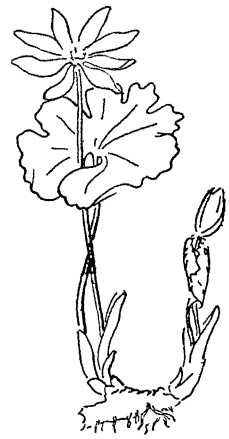
BUTTERCUP.

Don't call it a cowslip Cowslips or Marsh Marigold have leaves that are somewhat round.



MOSS PLANT.

Look closely at a bunch of moss on a log or stone.



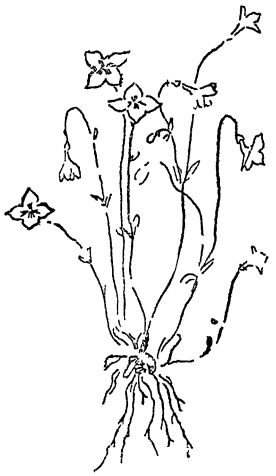
BLOODROOT.

VIOLETS

Sometimes called Johnny-jump-ups
They are blue, yellow, and white

JACK-IN-THE-PULPIT

or Indian Turnip



BLUETS, QUAKER LADIES, BLUE-EYED BABIES, OR BRIGHT EYES

DOG-TOOTH VIOLET.

Yellow flower and glossy mottled leaves

MAY.

MRS L. ALBERTINE GARVER. S. C. HANSON.